

REMARKS

Claims 37-40, 42-48 and 50-53 are pending in the present application. In the Office Action dated April 11, 2003, the Examiner rejected claims 37-40, 42, 45, 46, 47, 48 and 50 under 35 U.S.C. § 102(a) as anticipated by U.S. Patent No. 5,769,699 to Yu ("Yu"). The Examiner also rejected claim 44 under 35 U.S.C. § 103(a) as unpatentable over the Yu reference. Claims 43 and 51-53 were further rejected under 35 U.S.C. § 103(a) as unpatentable over the Yu reference and further in view of U.S. Patent No. 6,290,572 B1 to Hofmann ("Hofmann"). Applicant respectfully requests reconsideration of the present application in view of the present amendments and following remarks.

In the remarks that follow, various technical differences between the references cited by the Examiner and the embodiments of the present invention are discussed. It is understood that the discussion involving various embodiments of the invention, which are disclosed in detail in the applicant's specification, do not define the scope or interpretation of any of the claims. Any discussion of differences between the references cited and the various embodiments of the invention are intended only to help the Examiner to appreciate the importance of the claimed distinctions as they are discussed.

The disclosed invention is directed towards methods and apparatuses for planarizing microelectronic substrates. In a pertinent embodiment of the disclosed invention, as shown in Figure 6 of the present application, a membrane 250 is positioned within a substrate holder 231 that retains a substrate 112 while the substrate is planarized. The membrane 250 includes a peripheral portion 251 that may have a thickness greater than the central portion 252. Alternatively, in still other embodiments, the peripheral portion 251 may have a thickness that is thinner than the central portion 252. In either case, the membrane 250 may be fabricated from a generally flexible, compressible solid material, as shown in Figure 6, which may be comprised of neoprene or a silicone rubber, although other resilient, flexible and compressible materials may be also be used to fabricate the membrane.

When the substrate 112 is undergoing planarization, the substrate holder 231 and the membrane 250 apply downward forces onto the substrate 112 to force the substrate 112 against a planarization pad (not shown in Figure 6). The relatively thicker portions of the membrane 250 correspondingly exert a greater force on portions of the substrate 112 that

contact the thicker portions of the membrane 250, while the relatively thinner portions of the membrane 250 exert a lesser force on other portions of the substrate 112. Consequently, the portions of the substrate 112 subjected to the greater normal force are planarized at a greater rate than the portions of the substrate 112 that are in facial contact with the thinner portions of the membrane 250. In particular, when the thicker portions of the membrane 250 are positioned in the peripheral portion 251 of the membrane 250, substrates 112 having features toward the periphery of the substrate 112 that require higher planarization rates are more effectively planarized since the additional normal force presented by the peripheral portion 251 allows the substrate periphery to be planarized at a greater rate than is achievable by the greater linear velocity at the periphery of the substrate 112 alone.

The Examiner has cited the Yu reference as pertinent to the patentability of claims in the present application. Yu discloses a polishing pad that improves polishing uniformity by having regions on the pad that have different thicknesses. Referring now to Figure 4 of the Yu reference, a polishing pad 31 is positioned on a platen 14. Substrates 13 are retained by substrate holders 12 that force the substrates 13 onto a surface of the pad 31 as the pad 31 is rotated by the platen 14. The pad 31 includes a raised central region 32 having a first thickness, and having a peripheral region 33 having a second thickness. Accordingly, the pad 31 may apply different forces to the substrates 13 as they are planarized.

Yu does not disclose or fairly suggest biasing a substrate against a planarizing medium with a flexible membrane to exert a first force on a first part of the microelectronic substrate and exert a second force greater than the first force on a second part of the microelectronic substrate, where the substrate is held stationary relative to the membrane as the substrate is biased against the planarizing medium.

The Examiner has also cited the Hofmann reference. Applicant respectfully asserts that the Hofmann reference and the present application were commonly owned at the time the present invention was made. Accordingly, the Hofmann reference is disqualified as a 35 U.S.C. § 103(a) reference under 35 U.S.C. § 103(c).

Turning now to the claims, patentably distinct differences between the applied references and the claim language will be specifically pointed out. Claim 37, as amended, recites in pertinent part: "A method for planarizing a microelectronic substrate, comprising...biasing the microelectronic substrate against a planarizing medium with a flexible membrane to exert a first force on a first part of the microelectronic substrate and exert a second force greater than the first

force on a second part of the microelectronic substrate, *the substrate being held stationary relative to the membrane as the substrate is biased against the planarizing medium...and...moving at least one of the microelectronic substrate and the planarizing medium relative to the other to remove material from the microelectronic substrate.*” (Emphasis added). Yu does not disclose or fairly suggest this. Instead, Yu discloses a polishing pad having regions of varying thickness that rotates with a platen so that the substrate moves relative to the polishing pad. Claim 37 is therefore allowable over the cited reference. Claims depending from claim 37 are further allowable based upon the allowable form of the base claim and further in view of the additional limitations recited in the dependent claims.

Claim 48, as amended, recites in pertinent part, “A method for planarizing a microelectronic substrate, comprising...biasing a first annular part of the microelectronic substrate against a planarizing medium with a first force by engaging the first annular part with a first portion of a flexible membrane having a first thickness...biasing a second annular part of the microelectronic substrate against the planarizing medium with a second force greater than the first force by engaging the second annular part with a second portion of the flexible membrane having a second thickness greater than the first thickness, *the substrate being held stationary relative to the membrane as the first annular part and the second annular part of the substrate is biased against the planarizing medium...and...moving at least one of the microelectronic substrate and the planarizing medium relative to the other to remove material from the microelectronic substrate.*” (Emphasis added). Again, the Yu reference does not teach or disclose this. Instead, Yu discloses a polishing pad having a varying thickness that moves relative to the substrate. Claim 48 is also therefore allowable over the Yu reference. Claims depending from claim 48 are also allowable based upon the allowable form of the base claim and further in view of the additional limitations recited in the dependent claims.

With respect to the Examiner’s rejections under 35 U.S.C. § 103(a), applicant respectfully submits that claims 43 and 51-53 are similarly in allowable form due to the disqualification of the Hofmann reference under 35 U.S.C. § 103(c).

All of the claims remaining in the application are now clearly allowable.
Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,

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Enclosures:

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